(2)

26 June 1992

Dr. Bertram H. Hui
Defense Advanced Research Projects Agency
Defense Sciences Office
Virginia Square Plaza
3701 North Fairfax Drive
Arlington, VA 22203-1774

Reference: Contract MDA 972-91-C-0029
ARPA Order No. 8162
(SRI Project ECU-2743)

Subject: Quarterly R&D Status Report
Covering the Period 1 January 1992 to 31 March 1992
"Field-Emitter Arrays for RF Vacuum Microelectronics"

Dear Dr. Hui:

This report covers the second quarter of Phase I of a research and development program on the SRI Spindt-type field-emitter-array cathode with a view toward eventual applications in microwave amplifiers, and is submitted in accordance with CDRL 0002AA. The goals of this first phase have been set at 5 mA total emission with a current density of 5 A/cm^2 for at least 1 hr, and demonstrated modulation of the emission current at a frequency of 1 GHz. Our approach has been to identify methods of adapting and modifying the basic cathode structure for microwave operation and to experimentally investigate means of implementing those methods.

Progress Summary

As reported earlier, cathode fabrication was curtailed during this period because of vacuum equipment failure.

Design work on the high-frequency test apparatus was completed, and fabrication of the apparatus was begun. All the required components that were to be obtained from outside vendors have been acquired. The apparatus is complex, and requires the development of some bonding technology to connect the microstrip lines to the cathode electrodes and SMA coaxial connectors. Thus, completion of the apparatus is not expected until near the end of the next quarter.

SRI International
333 Ravenswood Ave. • Menlo Park, CA 94025 • (415) 326-6200 • TWX 910-373-2046 • Telex 334486 • Facsimile (415) 326-5512

A life test of a 1000-tip cathode operating at 15 μA/tip peak emission with a 60-Hz half-wave rectified driving voltage (≈ 20% duty cycle) is continuing with no significant change in the cathode's performance. The cathode had been operating at the 15-μA/tip level for over 2700 h as of the end of this report period.

A task to study the development of a bright light source based on the field-emitter array and cathodoluminescent phosphors was added during this period. A test system has been designed, and some vacuum vessel parts required for assembling the system have been ordered.

Work Planned

During the next period we plan to complete the fabrication of the high-frequency test vehicle. We also hope to have our cathode fabrication apparatus back on line and to be processing low-capacitance cathodes for the high-frequency tests.

Equipment Purchases

No new equipment was purchased

Key Personnel

There have been no changes in personnel.

Travel Summary

No travel occurred during this period

Related Accomplishments

Papers reporting this work were submitted to the Monterey Power-Tube Conference and the Fifth International Vacuum Microelectronics Conference.

Financial Summary

The table on the following page summarizes the financial activity for this period

R&D STATUS REPORT

PROGRAM FINANCIAL STATUS

		Cumulative to Date (3/28/92)			At Completion	
Element	Planned Expenditures	Actual Expenditures	Percent of Completion	Budget at Completion	Latest Revised Estimate	Remarks
Total project	556,388	410,741	26.7	1,535,742	1,535,742	
Total	556,388	410,741	26.7	1,535,742	1,535,742	

Based on currently authorized work:	Yes	No	Amount
1. Is current funding sufficient for the current fiscal year? (Explain in narrative if "No")	√		1,106,162†
2. What is the next fiscal year's funding requirement at current anticipated levels?			429,580
3. Have you included in the report narrative any explanation of the above data and are they cross referenced?		√	

Note: Budget at completion changes only with the amount of any scope changes. (Not affected by underrun or overrun).

* All dollars include fee.

† Does not include option ($760,114).

Questions of a technical nature should be addressed to the undersigned at (415) 859-2993; contractual and administrative matters should be addressed to Ms. Barbara E. Camph, Group Manager, Engineering Contracts at (415) 859-4328.

Sincerely,

C. A. Spindt, Program Director
Physical Electronics Laboratory

cc: Mr. Thomas F. Griffin, DSO
Mr. Donald C. Sharkus, CMO

DCMAO—San Francisco
Attn: Capt. Peter L. Regan, Jr.

Defense Technical Information Center
Building 5, Cameron Station
Alexandria, VA 22304
Attn: Selections